SeizSmart
A mobile application for detecting, tracking, and reporting seizures in real time.

Prototype Demo Presentation
CS 411 Fall 2019
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[Live Demo]
What have we accomplished?

Watch
- Notifying emergency contacts directly from the smartwatch
- Internal SQLite Database
- Perform detection using biometric readings

Phone
- Internal SQLite Database
- Adding emergency contacts
- Stats Visualization

Server
- All API Endpoints Functional
- NN Training Operational
- SMS Gateway Operational
- Public Unit Test Reports
- Public Javadoc for Core library
SeizSmart-Watch Git Log

- Merge branch '17-add-environmental-data-sqlite-database-table' into 'master'
- Added table for environmental data in SQLite database.
- Merge branch '14-send-text-message-to-emergency-contacts-on-watch' into 'master'
- Send request to send text message to notify one contact.
- Build request for HTTP request to notify one contact.
- Merge branch '13-convert-calculus-to-fahrenheit' into 'master'
- Added function to convert Celsius to Fahrenheit. Also updated formatting/style in other functions.
- Merge branch '12-lower-smart-watch-to-as-in-order-to-install-to-physical-watch' into 'master'
- Lower skin and version to 2/5.
- Merge branch '11-configure-temperature-sensor' into 'master'
- Fix merge conflicts.
- Set data for all environmental variables (light, ambient temperature, relative humidity, and pressure) and output reading to screen.
- Adjusted constraints for round watch.
- Merge branch '10-add-accelerometer-and-gyro-sensors-and-display-live-output' into 'master'
- Display live accelerometer data on the UI.
- Add UI for sensor values.
- Updated class name to EnvironmentData.
- Add layout for seizure detection activity.
- Access accelerometer sensor and add seizure detection activity.

- SensorData class created for retrieving sensor data from smartwatch.
- Merge branch '9-add-disclaimer-activity-with-static-text' into 'master'
- Add missing string values.
- Merge branch '8-add-intel-screen' into 'master'
- Added Disclaimer activity. Continue button takes user to Emergency Contacts screen.
- Added basic startup screen for watch app.
- Merge branch '7-add-sqlite-database' into 'master'
- Move SensorData classes to its own directory.
- Set exportorder to false for now.
- Add environmental data variable.
- Organize database classes to have their own directory.
- Add type converters.
- Add database access object with basic queries.
- Add room persistence for obstruction over SQLite database.
- Add DatabaseHelper.java.
- Add main.js.
- Add boilerplate code for watch app.
SeizSmart-Watch

Code Burndown
SeizSmart-Phone Git Log
SeizSmart-Phone
Code Burndown
SeizSmart-Core Git Log

- added another example to readme
- java 13 is a bit broken
- added code to reset java to 13 on jeffs machine
- updated docs from unit tests that passed
- added javadoc link to websocket primitives
- fixed test for websocket alerting
- added non-sms alert integration test
- added unit test upload
- added an integration test as a unit test to ensure server returns sane NW
- typo?
- improved javadoc, added links
- Removed old (and unrelated) docs, added use example for watch implementation
- added now_s utility method
- copied AI core from seizsmart-server and wrote a deployment script
SeizSmart-Core
Code Burndown

Core originated in SeizSmart-Server and does not have much history.

Every abstraction was useful and correct because it was already tested in the server codebase.
SeizSmart-Server Git Log

- added .dev-config file to avoid keeping secrets in source code
- updated docs for GUI mysql client
- properly added mysql to .jar for deployment
- added link to API endpoint docs and began mysql DB connection work
- more docs for API endpoints
- better example
- more examples for API endpoint data formats
- added javadoc generation command
- added checkstyle config + documented some common tasks
- Merge branch 'incomplete-docs'
- remove auth, SESSION_TOKEN will be {} for all prototypes
- added a script to pretty-print git log
- Merge branch 'master' into incomplete-docs
- added checkstyle plugin
- initial API endpoint outline
- basic HTTP server implementation
- updates to deployment script in prep for server automation
- some untested update script logic
- add restart config to prevent seizsmart.service from being down
- add space to prevent unwanted emoji in text
- added documentation about a super unsafe gnu address
- fixed mysql connection issues - looks like GDU accounts have auth issues however.
- implemented ability to send SMS via arbitrary email address (pulled from config so we don't commit)
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- dumb typo
- partial support for issue #4, testing shows many SMS gateways have DNS blacklisting so we will need
- remove unnecessary prelude in server websocket onOpen, added a cache removal for closed client connections
- removed unrelated unit tests and fixed some JSON errors found while testing
- added docs for new /trained-algo format
- fixed null check while curl testing and added a
- some initial training work using the new core library
- pulled core functionality out into seizsmart-core, a separate lib to provide core AI functionality
- make test so it can actually fail
- w0t we learned some stuff
- some experimental horrid monstrosity of network "training"
- implemented non-sms notifications for issue #4, also implemented websocket server with alert clearing
- implemented basic websocket server for issue #5
- added link to server in api endpoint docs
- initial API endpoints, begins work for issues #2, #3, #4
SeizSmart-Server
Code Burndown
## Issue board

### Open
1. **UI: add about page**
   - Status: In Progress
   - Description: fall2019-411-silver/seizsmart-android#6

2. **Create Seizure Detected - Abort Alert Screen**
   - Status: In Review
   - Description: fall2019-411-silver/seizsmart-watch#9

3. **Create Seizure Detected Contacts Notified Screen**
   - Status: In Progress
   - Description: fall2019-411-silver/seizsmart-watch#10

4. **New Emergency contact must be added to server database**
   - Status: Open
   - Description: fall2019-411-silver/seizsmart-android#12

5. **read emergency contacts from SQLite database**
   - Status: In Progress
   - Description: fall2019-411-silver/seizsmart-watch#5

6. **Check sensors and sensor capabilities on smartwatch**
   - Status: In Progress
   - Description: fall2019-411-silver/seizsmart-watch#13

### To Do
1. **Implement API endpoint /biometrics**
   - Status: To Do
   - Description: fall2019-411-silver/seizSmart-Server#2

2. **Modify 'notify' API**
   - Status: To Do
   - Description: fall2019-411-silver/seizSmart-Server#6

### Closed
1. **Install MySQL for the external database**
   - Status: Closed
   - Description: fall2019-411-silver/seizSmart-Server#1

2. **UI: Add initial screen**
   - Status: Closed
   - Description: fall2019-411-silver/seizsmart-android#1

3. **UI: Existing user should transition to empty activity**
   - Status: Closed
   - Description: fall2019-411-silver/seizsmart-android#2

4. **add listview for emergency contacts**
   - Status: Closed
   - Description: fall2019-411-silver/seizsmart-watch#2

5. **Add new emergency contact via settings page**
   - Status: Closed
   - Description: fall2019-411-silver/seizsmart-android#1

6. **UI: New user should transition to empty activity**
   - Status: Closed
   - Description: fall2019-411-silver/seizsmart-android#3

7. **Implement API endpoint /trained-algo**
   - Status: Closed
   - Description: fall2019-411-silver/seizSmart-Server#3

8. **add "Add New" button for emergency contacts**
   - Status: Closed
   - Description: fall2019-411-silver/seizsmart-watch#3
Issue Board Summary

- Frontend user interface
- API additions to make frontend development easier
- Combine “In Progress” and “Doing” issue labels
Challenges we’ve been facing

- Tensorflow was a poor choice for our problem domain
- SMS Gateway security necessitated the creation of a Gmail account
- Unclear server API documentation needed more example code
- Android Studio fills disks to 100% making development VMs unusable
What’s next?

Watch

- Begin collecting heart rate and gyroscope data to determine the onset of a seizure

Phone

- Add ability to log seizures from smartphone
- Clear seizure alert using smartphone

Server

- Persist Biometrics in MySQL
- Add heart rate and gyroscope data to biometrics being considered for training
- Create API endpoint to add new emergency contact to server from smartphone
- Receive new seizure tag from smartphone
Screenshots: Watch

Emergency Contacts
- ENVIRONMENTAL DATA
- COUNTDOWN ACTIVITY
- SEIZURE DETECTION

acc_x: 0.33
acc_y: -0.57
acc_z: 9.74

Turn Detection on/off
Screenshots: Watch

Seizure Detected!

Temperature F: 68
Illuminance: 77.00 lux
Air Pressure: 1013.25 hPa
Humidity: 0.00%
Screenshots: Phone

SeizSmart application is designed to monitor movements, heart rate, and detect shaking or elevated/decreased heart rate. It is not intended for diagnosis, monitoring, prevention, or treatment of disease. Users can enter their name and phone number in the settings. This information should not be used to diagnose or treat a health problem or disease without consulting a qualified healthcare provider.
Screenshots: Phone